

Best Practices for
Communicating Air Quality and Related Health Information
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INTRODUCTION

In April 2004, the Children's Environmental Health Center in the California Environmental Protection Agency and the California Asthma Public Health Initiative in the California Department of Health Services convened a workshop (<http://www.calepa.ca.gov/childhealth>) to hear and learn about the policies and procedures used by air districts and school districts to communicate air quality and related health information. The importance of better understanding the air quality information available from the air districts directly relates to the decisions schools and after-school programs must make regarding children's outdoor activities on poor air quality days. To share what we learned from our studies, interviews, and the workshop, we prepared this list of "best practices" for communicating air quality and health information.

There are 35 air quality management districts (AQMDs) in California. Those with the largest population centers and agricultural areas have air quality that does not meet federal or state standards for ozone and particulate matter (PM). These districts are required by federal rules to provide the public with air quality information, usually in the form of the air quality index (AQI) developed by the US EPA. The air districts are also motivated to have the public reduce vehicular and combustion emissions in order to meet federal air quality standards. For example, the larger air districts pay for Spare-the-Air Day public service announcements on television and radio. The State of California requires in its Air Pollution Emergency Plan that local air quality districts notify school personnel when air pollutants reach, or are predicted to reach specified levels.

There are over 1,000 school districts in California and thousands of schools throughout the state. Fortunately, not all are impacted by poor air quality and many are only impacted occasionally during the school year. But, as the school year begins to include summer, ozone and PM tend to affect more schools and organized after-school activities. Some schools in large urban areas must contend with many poor air quality days. Schools that prepare for poor air quality days, similar to what is done for snow days in the East, can still meet physical fitness goals for their students. We discuss below how schools can receive, understand, use, and disseminate the air quality information that is readily available to them. With modest effort, school districts, schools and after-school programs can plan for and adapt to poor air quality days.

This work was funded by the Environmental Council of the States (ECOS) in Washington DC. One of the goals of the ECOS Asthma Action Agenda is to reduce exposures to outdoor air pollutants that can trigger asthma in children. Implementing one or more of the best practices and recommendations from the workshop should help to achieve that goal.

The following pages outline suggestions and recommendations for air districts and school districts for improvement and uniformity in some key areas. We found significant differences among air districts in how air quality information is reported to the public and the schools. We found that there are different air quality standards for the same pollutant based on how long the pollutant is measured or averaged over time. We learned that the limited reporting of the one-hour standard and AQI for ozone will give way to the more widely used eight-hour standard and AQI. The eight-hour fine particulate (PM_{2.5}) standard and AQI established in 1999 will predominate in 2005 as more PM_{2.5} monitors are put into service and air quality is found not to meet this standard. All of these impact how schools and after-school programs make decisions on how to reduce the risks of exposures to air pollutants.

I. Recommendations for Air Districts in Communicating Air Quality Information

A. Preferred content when disseminating air quality information to schools

1. Clearly identify or distinguish among Health Advisory Notices, Spare the Air notices, and Air Alerts
2. Time and date notice or alert issued
3. Valid time period (start and end) for the notice, alert, or forecast
4. Pollutant(s) for which the notice or alert is issued
5. The units (ppb, ppm, ug/m³) and time averaging period (1-, 8-, 24-hrs) for the pollutant reported
6. For the calculated AQI, specify 1-hr, 8-hr, or 24-hr
7. Include a probability or confidence statement in forecast values
8. Specify the geographical location affected by the notice or alert
9. Include meteorology contributing to the poor air quality and how long it is expected to continue last
10. Cautionary health message(s), as applicable
11. Where to go to get more information (air district's Web page)
12. Who to call for additional information (meteorologist or public information officer, phone number and e-mail address)

B. Optimum times to issue air quality information to schools

1. Schools prefer next-day forecasts by 11:00 a.m., but not later than 2 p.m.
2. Schools need hourly updates of current day's forecast when it exceeds an AQI of 100 ("unhealthy for sensitive subgroups")

C. Post key staff contacts on the district's Web page including:

1. Meteorologist(s) for forecast air quality and unexpected conditions such as fires and smoke

2. Public information officer for cancellation of scheduled events due to poor air quality (e.g., interscholastic sporting events)

D. Conduct focused outreach to schools

1. Get invited to school board meetings – explain the importance of understanding air quality as it affects children at play
2. Offer to meet with school officials on developing school policies for poor air quality days
3. Offer to be part of “science days” at schools and tell students about air quality and how it can affect them while at play

II. Recommendations for School Districts on Receiving Air Quality Information

A. Where to get current and next day’s air quality information:

1. From your local air quality district via:
 - a. Web page is the most up-to-date source
 - b. Automated telephone answering service
 - c. e-Mail notification from a subscribers’ list (list server)
 - d. Facsimile notification
 - e. Digital cell phone notification
 - f. Digital pager notification
2. ARB Air Quality & Meteorological Information System (AQMIS) Web site (<http://www.arb.ca.gov/aqd/airqualitytoday.htm>) (note: AQI forecasts are not available)
3. US EPA’s Air Now Web site (<http://www.epa.gov/airnow/index.html>) (note: AQI forecasts are available at 1:15 Pacific time at: <http://www.epa.gov/cgi-bin/airnow.cgi?MapDisplay=FOREMAP>; with tables at: <http://www.epa.gov/cgi-bin/airnow.cgi?MapDisplay=FORECAST>]. Many stations forecast ozone, some forecast PM_{2.5}, and a few forecast PM₁₀.
4. Local newspaper
5. Local radio or television news station

B. When you hear or read about air quality reported as an air quality index, or AQI, you also need to know:

1. Which pollutant the AQI refers to (of five possible AQI pollutants, ozone or PM most often determine the AQI)
2. What the reference time (1 hr, 8 hr, 24 hr) is for the pollutant standard
3. Where it applies, what geographical area or region is affected
4. When the AQI is valid, e.g., is it a forecast, current (real time), or historical measurement (last 8 or 24 hours).

C. Verify the AQI information:

1. For the most recent measurements of ambient concentrations of air pollutants, go to your local air district's Web page and look at the data for the air monitoring station nearest you. Local air districts often show a map of the counties they serve and the location of the air monitoring stations, or sub-regions where pollutants are measured (e.g., by zip codes or other identifiers).
2. Alternatively, the California Air Resources Board in Sacramento collects and displays the same raw data as the air districts plus data from its own monitoring network on its Air Quality and Meteorological Information System (AQMIS) Web site at <http://www.arb.ca.gov/aqd/airqualitytoday.htm>. This site covers the major urban areas and is continuously adding more.
(Please see appendix for detailed information on the use of this Web site.)
3. US EPA also operates an air quality information site at <http://www.epa.gov/airnow/where/california.html>. *(Please see appendix for discussion on use of this Web page.)*
4. Disseminate the appropriate health information to school sites and staff:
 - a. Make sure you are using the health advisory and cautionary messages from US EPA specific to the air pollutant you are concerned about. There are five pollutants that can determine the AQI, only the highest one determines the AQI for the day. If the AQI is determined by ozone, use the ozone cautionary health messages appropriate to either the one-hour or eight-hour standard. Be sure that the time averaging period (1 hr, 8 hr, 24 hr) for the standard is what you are interested in – ozone has two different averaging times.
 - b. Take into consideration the duration of the planned outdoor activities and try to match this with an AQI based on a similar time averaging period. AQI advisories are health-based, and the averaging period reflects the duration of exposure for which there is health effects information. A 15-minute school recess, or a 1-hr physical education class, is a much shorter exposure than eight or 24 hours and therefore entails less risk at the same ambient concentrations of a given pollutant.

D. Coordination

1. Work with the California Interscholastic Federation in coordinating sporting events that may be subject to cancellation due to poor air quality
2. Work with neighboring school districts and schools on policies for canceling and rescheduling sports events on poor air quality days (include with inclement weather policies)

III. Recommendations for schools on planning for poor air quality during the school year

- A. Determine number of days in the school year that air quality may affect outdoor activities
 - 1. Meet face-to-face with local air district representatives and determine what months of the school year are affected, how many days per school month and the approximate times of the day you may experience poor air quality. Air districts retain decades of historical records and information on air quality.
 - 2. If you cannot meet with your local air district, the California Air Resources Board's AQMIS Web site can be used as a planning tool. *(Please see appendix for how to use AQMIS for Current Years Ozone Air Quality.)*
- B. Know the students with health conditions that would limit their outdoor activities on a poor air quality day. Children with heart or lung disease are at greater risk from air pollution than children without these diseases. These children should be identified and may require special care when air quality is poor.
 - 1. When the AQI is judged to be "unhealthy for sensitive groups," make indoor space available to for children with respiratory disease such as asthma; however, let them play outside with the other children if there are no prohibitions against it (e.g., their parents have requested it).
 - 2. Accommodating other sensitive children should be considered. For example, allow less strenuous activities, shorter periods of activity, and move indoors when necessary or possible.
- C. Develop lesson plans for poor air quality days
 - 1. Be prepared with alternative sports and exercises that can be performed on poor air quality days. Exercise is important to lung development and physical fitness.
 - 2. Modify the intensity and duration when needed. *Note: Permitting no physical activity should be a last consideration.*
- D. Conduct outreach and training
 - 1. Explain to parents the air quality index and school policies affecting outdoor activities on poor air quality days
 - 2. Meet with parents of children with asthma or other respiratory or cardiac diseases that might limit their full participation in outdoor sports on poor air quality days. Encourage the use of asthma management plans.
 - 3. If a flag system for notification of daily air quality conditions is in use, explain to parents and children how and when it is used to make decisions about outdoor activities.

4. Conduct training for school staff, including walk-on and part-time coaches and PE personnel about the air quality in your region and about school policies and practices for poor air quality days. Include them in the lesson-planning stages for poor air quality days and procedures to follow regarding sports practice sessions and games (both for days when the air quality is poor and the special needs of 'sensitive groups').
5. Coaches and PE instructors could work with school health personnel and parents of children with asthma. For example, parents of children with asthma, or any parent who is interested, would provide their e-mail addresses to a coach or PE instructor. On a code orange (AQI = 101 to 150) or code red (AQI = 151 – 200) air quality day, the coach or instructor would send out a message to the effect that "Today was a code orange day for ozone and we had soccer practice. Please notify the school health staff if your child has the following symptoms tonight or tomorrow: cough, chest pain, chest tightness, shortness of breath, increased need for asthma rescue medications, or even an asthma attack. If such symptoms occur repeatedly after practice on a code orange air quality day, you may need to talk to your child's physician about precautionary or preventive measures." Such notification and response would provide a feedback loop for parents to interact with the school and find out which kids are being affected. It would also allow most kids to play outside and get the exercise that they need.

E. Know the "rules" – know what is required and what is optional

1. As of May 2004, the only rules governing notification of school officials by local air districts are contained in the State's "Air Pollution Emergency Plan" (revised September 13, 1990) found in Chapter 21 of the State Implementation Plan for achieving federal standards for air quality. The rules define four air pollution episodes, starting with the Health Advisory Episode and ending with a Stage 3 "Smog" Episode. Affected air districts have incorporated these state-level rules into their district-level rules with additional information specific to their district.
 - a. The Ozone Health Advisory Episode is declared when the ambient concentration of ozone reaches, or is predicted to reach 0.15 ppm for one hour or more. The local air district is required to "notify schools that sustained (outdoor) rigorous exercise for more than one hour by students must be discontinued."
 - b. Carbon Monoxide and Sulfur Dioxide Health Advisories and Stage 1 Smog Episodes are rarely issued. There are currently no provisions at the state level for staged episodes based on particulate matter (PM) pollution.

2. Spare-the-Air public service announcements and Air Alerts are not part of the state's Air Pollution Emergency Plan. School districts and schools are not required to take any actions based on Spare the Air Days or Air Alerts. However, schools are not precluded from using this information to reduce children's exposures. Schools must be aware of how air quality is measured under these programs and what the health cautionary messages mean when they are applied to less than 8- or 24-hour exposures.
3. School districts can establish policies for the protection of children from the harmful effects of poor air quality. These policies become the "rules" the schools and school staff must implement.

Appendix

Air Quality and Meteorological Information System (AQMIS)

Web site at <http://www.arb.ca.gov/airqualitytoday> (Home page)

To view local air quality data, click on the “Today’s Hourly Data” and pick either your county or air basin. The default date is for the current day and the default pollutant is ozone, at this point all you have to do is click on the “Get Data” button. The monitoring sites in your county should be listed, click on the site nearest you to display the current and previous 30 days of air measurements. Near the bottom of the page, you can choose the time of day, before noon, mid day and after noon, or whole day. *Note: The units of measurement are in ppb (note: ppb = ppm X 1,000); this allows data to be displayed in whole numbers rather than decimals or fractions.*

You can also look at trends of ozone formation from the morning through the afternoon and compare with previous days over the last 30 days. Such patterns allow one to estimate when ozone might peak during the day in your area.

Converting air quality measurements (ppm or ppb) to AQIs

Next, you can convert the ambient air measurements to an AQI by using US EPA’s calculator at http://www.epa.gov/airnow/aqi/conc_aqi_calc.html. Make sure the units of measurement for ozone and the averaging time from the AQMIS Web page are the same as the ones used to convert to an AQI on the US EPA Air Now Web page. Note that federal, not state air quality standards, are used to determine AQIs. Note also that one-hour ozone measurements at or below 124 ppb will be shown as “out of range” using US EPA’s on-line calculator. This is because these values are considered below the 1-hr standard of 120 ppb (due to rules for rounding of numbers, 124 is treated as 120) and air quality is considered “good” (green) to “moderate” (yellow). A benefit of using US EPA’s AQI calculator is that it includes cautionary health statements for each AQI at or above 101 (orange) for hourly ozone measurements.

Comparing air quality measurements to federal and state standards

You can also directly compare local ambient air quality measurements to the federal (or state) ambient air quality standards which can be found at <http://www.arb.ca.gov/aqs/aqs2.pdf>. A ratio of less than 1 (unity) is considered “good-to-moderate” air quality. A ratio greater than 1 (unity) would be “unhealthy for sensitive groups” or possibly worse. Recommend using US EPA’s on-line AQI calculator (http://www.epa.gov/airnow/aqi/conc_aqi_calc.html) when the ratios are greater than unity.

How to access air quality information on US EPA's Air Now Web site

U.S. EPA's Web site (<http://www.usepa.gov/airnow/where/california.html>) can be accessed for forecasts and real-time air quality in your area. Click on the map covering your air basin, select your city or area, and click on real-time AQI data. For ozone, this is usually based on the latest one-hour reading but is reported as "current" 8-hr ozone AQI.

Note: The "current" 8-hr ozone AQI is based on the average of the previous four hours of data and estimates of the next four hours. ("Yesterday's" 8-hour ozone AQI was based on eight 1-hour measurements and "tomorrow's" 8-hour ozone AQI is based on forecasts.) An 8-hour averaging time for ozone may not meet the needs of schools planning for 15-minute recesses and 1-hour physical education classes. In principle, a 1-hr standard is protective of 1-hour or less of exposure, while an 8-hr standard is protective for up to eight hours of exposure. Applying an 8-hr standard to a 15-minute recess or a 1-hour PE class would be "overly"-protective of the general population.

How to access AQMIS for Current Years Ozone Air Quality

Go to the home page at <http://www.arb.ca.gov/airqualitytoday> and select "Current Years Ozone Air Quality." Air monitoring data is available for six regions (areas, air basins, and counties) of the state. In the table on the screen, go to the row with the year of interest and click on the national 1-hr ozone exceedance data. The next table that appears is the highest daily 1-hr ozone levels for each day of the calendar year selected. Days are color-coded as to whether they exceed the state or national 1-hr ozone standard. Unlike federal standards, cautionary health information is not available for air quality based on the state's air quality standards making these standards more difficult to use in policy making at the school district level. Looking at the data for the six regions of the state shows that it is much easier to plan for five poor air quality days in the Sacramento region than 68 such days in the South Coast Air Basin or 37 in the San Joaquin Valley Air Basin. However, sub-regions within these six larger air basins may require little or no planning since air quality can vary widely within a large air basin (the SJV Air Basin is geographically the largest in the state). To determine how often a local area is affected, click on the day in your air basin that exceeds the national standard. The chart that appears is the monitoring data for all stations in the air basin on that day and the six preceding days. Click on one day for the station nearest you. The data that appears indicates the hourly ozone readings for that day and highlights those that exceed the state and federal standards one-hour ozone levels. As of September 2004, it is not possible to display one calendar year's worth of daily data for a single monitoring station, but the AQMIS Web page is being updated.